



# Rural Health Survey of Men Over Forty

By JOHN PEMBERTON, M.D., and KENNETH I. E. MACLEOD, M.D., M.P.H.

APPLICATION of preventive medicine to the later years of life is gaining attention from public health agencies. This is partly due to the remarkable decline in the mortality of children and young adults, which has brought the problems of morbidity and mortality in middle life into prominence, and partly to the failure of therapy in preventing the alarming rise in the death rates from certain diseases, such as coronary thrombosis and cancer of the lung, which bear most heavily on men in middle and later life.

A survey in 1955 was designed to find out something about the state of health, especially of the heart and lungs, of a group of men over the age of 40 who were living in a rural community. The study population, living or working in 6 of 16 towns of the Nashoba Health District in Massachusetts, was composed of all the men in the chosen age group who wished to be examined.

Altogether, 642 men came for examination. From many occupational classes, they included

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*Dr. Pemberton is a senior lecturer in social and industrial medicine in the University of Sheffield, England. From 1954 to 1955 he was a Rockefeller traveling fellow in medicine. Dr. Macleod is commissioner of public health in Worcester, Mass., and instructor in public health practice in the Harvard School of Public Health. He was formerly medical director for the Nashoba Associated Boards of Health, Ayer, Mass.*

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physicians, bankers, priests, farmers, school teachers, clerks, and industrial workers of various grades of skill. The factories in which these men worked were small, long-established concerns situated in rural townships ranging from 500 to 4,000 in population. The plants included a tannery, two paper mills, a cordage factory, a cutlery works, and a plant manufacturing elastic underwear.

The participation rate from the factories was high. From information about the number in the eligible age group in two factories, where this point was checked, it was found that 47 out of 54 had come from one factory and 50 out of 52 from the other. There is, therefore, reason to believe that the sample was representative. Of course, those who were unable to come because of sickness or disability were necessarily excluded.

Participation was encouraged by vigorous preliminary publicity organized by a women's committee, utilizing press and radio, and the response was almost overwhelming.

The survey lasted for 3 weeks. In addition to daily sessions, several evenings were devoted to examinations for the convenience of the industrial workers.

## Examination Procedures

A public health nurse recorded each patient's history of past illnesses, occupation, residence, and habits of tobacco smoking. The subject was weighed in indoor clothes and his height measured with his shoes on. Subsequently, 3 pounds was subtracted from the weight and three-fourths of an inch from the height.

A full-sized standard chest X-ray was taken. The Massachusetts Department of Public Health provided the chest X-ray machine and radiographers, and Dr. Marrian W. Perry of the State health department read the films. Helping organize the project were members of the Nashoba Health District Chest Survey Committee.

After the films were taken, each man was examined by one of the physicians with special reference to pulmonary disease. This examination included a respiratory function test, the 1-second timed vital capacity, to help detect emphysema (1). This test measures the vital capacity and also the proportion of the vital capacity which can be expired during the first second of a forcible expiration following a maximum inspiration. Finally, the subject was examined by the other physician with special attention to the cardiac system. This examination included measurement of the blood pressure with the subject in a sitting posture after a 5-minute rest. Whenever an abnormality requiring treatment was discovered, the subject was advised to see his private physician, to whom a report was sent.

The record sheets were designed to facilitate statistical analysis. The data were coded, transcribed, and punched on cards. Of the 642 records, 42 were incomplete, usually because the subject had failed to enter one examination room in his tour and had not been missed until after he had gone home. Thus, 600 completed records were available for analysis.

In selecting the data for presentation, we

**Table 1. Number and percent of study group, by age, Nashoba Health District, Massachusetts**

Age	Number	Percent
35-39	5	0.8
40-44	157	26.2
45-49	114	19.0
50-54	96	16.0
55-59	82	13.6
60-64	68	11.3
65-69	40	6.7
70-74	22	3.7
75-79	10	1.7
80-84	3	.5
85-89	3	.5
Total	600	100.0

**Table 2. Number and percent of study group, by occupational class**

Occupational classifications	Number	Percent
I. Unskilled labor	56	9.3
II. Semiskilled labor	196	32.7
III. Skilled labor	135	22.5
IV. Clerical	20	3.3
V. Retail proprietors, school teachers, and administrators	130	21.7
VI. Higher income professions	32	5.3
VII. Retired	30	5.0
Not recorded	1	.2
Total	600	100.0

have confined ourselves mainly to those conditions which were common, and we examined their prevalence in relation to certain identifiable characteristics such as age, weight, occupational class, and smoking habits.

### General Characteristics

A wide range of ages were represented, but the sample consisted mainly of the middle-aged (table 1). About 85 percent were between the ages of 40 and 65. Five men were under the age selected for study.

There were no nonwhite men in the sample. Eighty-five percent were born in the United States, 6 percent in Canada, and 9 percent in Europe.

Six occupational classes were represented, with semiskilled and skilled workers predominating. Only 5 percent of the men had retired (table 2).

The great majority of the sample had always, or nearly always, lived in rural neighborhoods: 79.2 percent had spent less than one-tenth of their lives in cities of 100,000 population or more.

### Tobacco Smoking

Table 3 shows the smoking habits of the sample for two age groups and for all ages. Of the lot, 28.8 percent were either nonsmokers or ex-smokers. Heavy cigarette smokers, defined as those smoking 20 or more cigarettes a day, were 38.3 percent of the total. The older men smoked less than the younger. A higher pro-

portion of those aged 55 or over had never smoked or had given up smoking, and the percentage of heavy cigarette smokers in the older group was only half that in the younger group. More older than younger men limited their smoking to a pipe or cigars.

The 89 ex-smokers were asked when they had abandoned the habit and for what reasons. There was evidence that the rate of giving up smoking had increased in recent years. More than a third of the ex-smokers had given up the habit during the 4 years immediately preceding the survey. Of the 55 who gave a reason for quitting, 18 said they did so to try to get rid of a cough, 10 stopped on medical advice, 2 quit after a surgical operation, and 24 gave non-medical reasons. Only one asserted that he stopped smoking because of publicity on cancer of the lung.

### Pulmonary Conditions

There were 13 cases of pulmonary tuberculosis suspected on the basis of the full-sized chest films. Of these, only one was ultimately found to be active. Three were of doubtful activity.

Chest radiography disclosed two suspected cases of neoplasm. One man was found to have a benign tumor of the lungs, which was successfully excised. The other, at the time of writing, had failed to consult his physician.

The prevalence of chronic nontuberculous pulmonary disease in the different age groups appears in table 4. The definitions of the dis-

eases listed and a description of the diagnostic methods are published elsewhere (2).

Approximately three-fourths of each age group had no detectable pulmonary condition. Primary asthma was ascribed if there was a history of typical asthmatic attacks starting before the age of 25. This condition was not rare and was fairly evenly distributed in the age groups studied. The last three groups in the table represent increasing degrees of severity of chronic respiratory disease which, when fully developed, may be called chronic bronchitis, emphysema, and bronchial spasm. In its fully developed form it was uncommon under the age of 65.

Smokers' cough was the term applied to cough symptoms in those men who were heavy smokers if the answer to the first of the following questions or to any four of the others was "yes" and if no other cause for the cough was found:

- Does the cough go if you give up smoking?
- Does the cough get less if you give up smoking?
- Do you think the cough is due to smoking?
- Is it a dry cough?
- Is the cough the same in the winter and the summer?
- Is it largely confined to the first hour after rising?
- Is the cough largely associated with the first cigarette?

The prevalence of smokers' cough diminished with advancing age. This may be related to the smaller proportion of heavy cigarette smokers in the older age groups (table 3).

Table 3. Tobacco smoking habits in study group, by age

Age	Total	Never smoked		Ex-smokers		Cigarettes per day										Pipe or cigar only or both		Unrecorded	
						5 or less		About 10		About 20		About 30		40 or more					
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	600	84	14.0	89	14.8	50	8.3	53	8.8	162	27.0	42	7.0	26	4.3	91	15.2	3	0.5
35-54	372	47	12.6	44	11.8	32	8.6	29	7.8	120	32.3	33	8.9	21	5.6	44	11.8	2	.5
55-89	228	37	16.2	45	19.8	18	7.9	24	10.5	42	18.4	9	3.9	5	2.2	47	20.6	1	.4

The relationship between cigarette smoking and chronic respiratory disease, excluding the 72 men with smokers' cough, appears in table 5. The frequency of chronic nontuberculous respiratory disease increased consistently through the various grades of smoking, from 4.8 percent in the nonsmokers to 29.4 percent in the heavy cigarette smokers. (The  $X^2$  test showed that this association of chronic nontuberculous respiratory disease with tobacco smoking was highly significant,  $P > 0.001$ ).

### Respiratory Function

There was an interesting association between tobacco smoking and respiratory function as measured by the timed vital capacity test (table 6).

The incidence of abnormally low vital capacity was considerably lower in the lifelong nonsmokers than in the other groups. The differences, however, did not quite reach the conventional 5 percent level of statistical significance. To measure the relationship between the vital capacity measurements and tobacco smoking history, the man's vital capacity was expressed as a percentage of the value predicted for him by use of the formula of Baldwin, Cournand, and Richards (3). More of the smokers had abnormally low vital capacities than the nonsmokers or ex-smokers; but, again, the differences were not statistically significant.

It was found that 51 out of 233 heavy cigarette smokers gave a history of wheezing (21.9 percent) compared with 12 out of 171 nonsmokers or ex-smokers (7.0 percent). The

**Table 4. Chronic nontuberculous pulmonary disease in study group, by age**

Condition	Age								Total	
	35-44		45-54		55-64		65 and over			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Normal	118	72.8	155	73.8	104	69.3	56	71.8	433	72.2
Smokers' cough	25	15.4	29	13.8	15	10.0	3	3.8	72	12.0
Primary asthma	4	2.5	4	1.9	3	2.0	2	2.6	13	2.1
Emphysema or bronchial spasm alone or together	4	2.5	7	3.3	11	7.4	3	3.8	25	4.2
Chronic bronchitis alone or with emphysema or bronchial spasm	8	4.9	14	6.7	12	8.0	5	6.4	39	6.5
Chronic bronchitis with emphysema and bronchial spasm	3	1.9	1	.5	5	3.3	9	11.6	18	3.0
Total	162	100.0	210	100.0	150	100.0	78	100.0	600	100.0

**Table 5. Tobacco smoking and chronic nontuberculous respiratory disease, excluding smokers' cough, in study group**

Condition	Nonsmokers		Ex-smokers		Pipe or cigar only or both		Cigarettes per day				Total	
	Number	Percent	Number	Percent	Number	Percent	Less than 20		More than 20			
							Number	Percent	Number	Percent	Number	Percent
Normal	80	95.2	80	89.9	76	86.4	77	79.4	120	70.6	433	82.0
Chronic nontuberculous respiratory disease	4	4.8	9	10.1	12	13.6	20	20.6	50	29.4	95	18.0
Total	84	100.0	89	100.0	88	100.0	97	100.0	170	100.0	528	100.0

difference between these percentages was statistically highly significant.

The occupational and residential histories failed to reveal that more than a few had ever been exposed to harmful dust in their work or to air polluted by urban industry. It is assumed, therefore, that these factors had no significant part in the etiology of chronic respiratory ailments.

### Cardiac Conditions

Twenty-three of the men were under the care of a private physician because of known heart disease, usually coronary artery disease. An additional 10 reported that they had had a previous coronary thrombosis from which they had recovered. These 33 cases represented only the gross manifestations of cardiac disease. There were probably additional patients whose symptoms had not caused them to consult a physician.

Special questions were introduced soon after the start of the survey to detect the presence of angina pectoris. Altogether, 42 of 407 questioned (10.3 percent) gave a typical history of pectoral angina precipitated by effort.

The percentage of heavy cigarette smokers (20 or more a day) among those with angina pectoris was 40.5 percent, nearly the same as the percentage among those without angina, 41.6.

There was no significant difference in the distribution by occupational class among those with angina pectoris and those without. There was a significantly higher proportion with enlargement of the heart (diagnosed by the chest roentgenogram) in the subjects with angina

pectoris than in those without. And a greater proportion of those with angina pectoris had systolic blood pressures of 160 mm./Hg or more and diastolic blood pressures of 100 mm./Hg or more than in those without. The differences in this case, however, did not reach the conventional level of statistical significance.

### Overweight

Overweight was assessed by reference to average values of weight for given ages and heights, based on recent tables of mean weights at different heights and ages (4). All those who, at a given height and age, exceeded the mean weight by 10 percent or more were termed overweight. This group was further subdivided into those who were 10-19 percent overweight and those who were 20 percent or more overweight (table 7). Of the 600 subjects, 24 percent were overweight. More than 1 out of 10 exceeded by 20 percent or more the mean weight for age and height. The highest prevalence of overweight was found in the years 55-64. The apparent fall after this age may be attributed to a tendency for people to lose weight after the age of 64 or to higher mortality rates among those who are overweight. The association of certain signs of ill health with overweight was scrutinized.

Systolic and diastolic hypertension, pitting edema of the ankles, and a low vital capacity were more common among the overweight persons than among those of normal weight. The differences in these rates, however, did not reach the conventional level of statistical significance. Angina pectoris was equally common in those

**Table 6. Tobacco smoking and the 1-second timed vital capacity in study group**

Timed vital capacity	Nonsmokers		Ex-smokers		Pipe or cigar only		Cigarettes per day				Total	
	Number	Percent	Number	Percent	Number	Percent	Less than 20		More than 20		Number	Percent
							Number	Percent	Number	Percent		
Abnormally low (less than 65 percent)-----	3	3.6	8	9.0	8	8.8	9	8.7	30	12.9	58	9.7
Normal (65 percent +)----	81	96.4	81	91.0	83	91.2	94	91.3	203	87.1	542	90.3
Total-----	84	100.0	89	100.0	91	100.0	103	100.0	233	100.0	600	100.0

who were overweight and in the remainder. There was no association between overweight and occupational classification. The percentage of overweight persons in classes I and II combined was 23.8; in class III, 25.3; and in classes V and VI, 25.3. There was a slightly lower percentage of overweight subjects among the heavy smokers.

### High Blood Pressure

High blood pressure is often regarded as inimical to a long and healthy life, although

surveys of this type usually disclose a considerable number of symptomless individuals with high blood pressure readings, who appear to be in robust health and may indeed be of advanced age. Table 8 shows the distribution of systolic and diastolic pressures by age. The proportion with high systolic pressures (160 mm./Hg or over) increased steadily with advancing age. The proportion with diastolic blood pressures of 100 mm./Hg or more increased with advancing age until age 64 and then leveled off.

The analysis revealed no relationship between

**Table 7. Number and percent overweight in study, by age**

Overweight group	Age								Total	
	35-44		45-54		55-64		65+		Number	Percent
	Number	Percent	Number	Percent	Number	Percent	Number	Percent		
10-19 percent above average weight for height and age.....	22	13.6	27	12.9	26	17.3	4	5.1	79	13.2
20 percent or more above average weight for height and age.....	15	9.3	15	7.1	22	14.7	13	16.7	65	10.8
Total overweight.....	37	22.8	42	20.0	48	32.0	17	21.8	144	24.0
Total normal weight.....	125	77.1	168	80.0	102	68.0	61	78.2	456	76.0
Total all weights.....	162	100.0	210	100.0	150	100.0	78	100.0	600	100.0

**Table 8. Systolic and diastolic blood pressure in study group, by age**

Blood pressure (mm./Hg)	Age								Total	
	35-44		45-54		55-64		65+		Number	Percent
	Number	Percent	Number	Percent	Number	Percent	Number	Percent		
<i>Systolic</i>										
80-159.....	154	95.0	180	85.7	104	69.3	47	60.3	485	80.8
160-179.....	5	3.1	18	8.6	25	16.7	14	17.9	62	10.3
180-249.....	3	1.9	9	4.3	20	13.3	17	21.8	49	8.2
Unrecorded.....	0	.0	3	1.4	1	.7	0	.0	4	.7
Total.....	162	100.0	210	100.0	150	100.0	78	100.0	600	100.0
<i>Diastolic</i>										
0-99.....	148	91.4	177	84.3	116	77.3	62	79.5	503	83.8
100-119.....	13	8.0	26	12.4	25	16.7	11	14.1	75	12.5
120-149.....	1	.6	4	1.9	8	5.3	5	6.4	18	3.0
Unrecorded.....	0	.0	3	1.4	1	.7	0	.0	4	.7
Total.....	162	100.0	210	100.0	150	100.0	78	100.0	600	100.0

high systolic or diastolic blood pressure and occupational class or between high blood pressure and heavy cigarette smoking.

### Discussion

The survey was limited in scope. Its major emphasis was on the discovery of chronic pulmonary and cardiac disease in a sample of men residing in a rural area. They were not chronically exposed to the crowding and air of cities. They seemed reasonably prosperous, and, in the six factories we visited, the conditions of work appeared healthful.

On the whole, their health was favorable. There was little significant pulmonary tuberculosis. There were those with frank cardiac disease, as would be expected at these ages, and no doubt a further number with incipient cardiovascular conditions.

Chronic cough, if smokers' cough is included under this heading, was common. An attempt was made to distinguish chronic bronchitis cases in the group with coughs. When this was done, it appeared that approximately 10 percent of the whole sample had chronic bronchitis. In only 3 percent of the sample, however, did we find the fully developed syndrome of chronic bronchitis, emphysema, and bronchial spasm. Half of the 18 severe cases occurred in men over 65. Before this age, it was rare. The prevalence rate of chronic nontuberculous respiratory disease (excluding smokers' cough) was significantly and directly correlated with tobacco smoking. The relatively large proportion of smokers and ex-smokers with abnormally low 1-second timed vital capacities compared with lifelong non-smokers suggests a relationship between tobacco smoking and pulmonary function. Whitfield, Arnott, and Waterhouse (5) found evidence that tobacco smoking reduces the vital capacity and increases the ratio of residual air to total lung volume, and both Palmer (6) and Oswald and Medvei (7), in studies of large unselected population groups, found a direct relationship between the amount of cigarette smoking and the prevalence of chronic bronchitis.

The other most striking finding in this survey was the high prevalence of overweight. Life

insurance statistics have shown that overweight policyholders are more likely than those of normal weight to die of diabetes, diseases of the biliary tract, appendicitis, nephritis, cerebral hemorrhage, cirrhosis of the liver, heart disease, hernia, and intestinal obstruction (8). Among the overweight in this sample, there were higher prevalence rates of high blood pressure, pitting edema of the ankles, and low vital capacities, and there were fewer heavy cigarette smokers. None of these differences, however, reached the conventional level of statistical significance. There was no relationship between overweight and occupational class or between overweight and angina pectoris. Keys (9) has reported a similar lack of association between overweight and coronary artery disease.

The small sample we examined failed to show any significant impairment of health that might be attributed to a deficiency in diet, shelter, or working environment. On the other hand, it is possible that the heart, respiratory, and overweight conditions observed may be attributed in part to a contemporary mode of living. Relative affluence, associated with full employment at attractive wages, permits diets abounding in fats and of as many cigarettes as time permits. The ubiquitous automobile and other forms of power machinery materially reduce the need to burn fats by physical exertion. It may be suspected then that a mode of living no less than aging contributes to certain afflictions characteristic of middle and later life. Identification of such immediate, as well as earlier, sources of impairment to health is a new task for preventive medicine.

### Summary

Among 600 middle-aged and elderly men living in a rural area of Massachusetts, chronic cough, including "smokers' cough," was found to be common. Excluding cases of smokers' cough, there was a direct and significant relationship between tobacco consumption and the prevalence of nontuberculous chronic respiratory disease.

Only one case of active pulmonary tuberculosis was discovered.

Heart disease was not uncommon, and 3.6 percent were seeing a physician for this condition.

There were in addition, 10 men who had recovered from a previous coronary thrombosis.

Overweight was common; 13 percent were 10–19 percent above their expected weight for height and age, and a further 11 percent were 20 percent or more overweight.

It is concluded that conditions of prosperity may favor the development of certain diseases as was the case in the past and that a study of this relationship constitutes an important field for preventive medicine.

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## Center for Aging Research

In recognition of the urgent need to solve the special health problems of an aging population—the number of citizens over age 65 is expected to surpass 18 million by 1970—the Public Health Service on October 30 created a Center for Aging Research in the National Institutes of Health.

The center will coordinate research activities in the institutes and will stimulate additional research into the mechanisms involved in aging. Dr. G. Halsey Hunt, former associate chief of the Bureau of Medical Services has been named to direct its activities.

The new center is part of the Public Health Service's accelerated activities in the field of aging. Dr. John W. Porterfield, Assistant Surgeon General, will direct and coordinate all of the Service's activities in this field.

The Public Health Service has long been concerned with the health problems of the aging. In State and local health departments, restorative services for the aged are being supported in part by the Bureau of State Services. The major research effort of the Service has been centered in the National Institutes of Health, which at present is expending about \$2 million in its own research activities and in grant support of projects directly related to aging.

The accelerated programs will encourage and support research institutions in bringing the full range of biological, psychological, and social sciences to bear on the problem of aging. Part of the support to be provided by the Service will be in the form of research grants that will assist universities, medical schools, and other research institutions in establishing research centers on aging.